

CLAIMS

What is claimed is:

- 1 (Currently amended) A computer implemented process for content-based images search or retrieval with these steps: specifying sample images image(s) or/and segments segment(s) or/and directory and/or directories; specifying training parameters; training by clicking a button in the GUI or Graphical User Interface of the software implementation ~~training by one click~~; specifying the directory or directories to be searched; specifying search parameters; searching by clicking a button in the GUI of the software implementation ~~searching by one click~~.
- 2 (Original) A computer implemented process of claim 1, wherein the order of steps is altered to cover all possible combinations.
- 3 (Currently amended) A computer implemented process for image classification with these steps: specifying sample images or/and segments or/and directory and/or directories for each class; specifying training parameters; training by clicking a button in the GUI or Graphical User Interface of the software implementation; specifying the directory or directories to be searched; specifying search parameters; searching by clicking a button in the GUI of the software implementation for each class, and classifying the images by clicking a button in the GUI of the software implementation. ~~A computer implemented process for image classification with these steps: specifying sample image(s) or/and segment(s) or/and directory and/or directories; specifying training parameters; training by one click; specifying the directory or directories to be searched; specifying search parameters; searching by one click. Repeat the above process for each class. When the all classes are covered, classify the images by one click.~~
- 4 (Original) A computer implemented process of claim 3, wherein the order of steps is altered to cover all possible combinations.
- 5 (Currently amended) A computer implemented process of claim 1, search process, wherein the steps are saved in the batch code by clicking a Save button, recalled by clicking a file button, and executed by clicking a batch command button in the Graphical User Interface of the software implementation.

~~—A computer implemented process of claim 1 (search), wherein the steps are saved in the batch code and executed by a batch command. The batch code can be entered into the system in several ways, including:~~

- ~~a. Click a save button to save the current setting, including key, search directory, and parameters into a batch code.~~
- ~~b. Click a file button to recall one of many batch codes saved earlier.~~
- ~~c. Cut and paste or simply type in a batch code by keyboard.~~
- ~~d. Obtain the code from a file.~~

6 (Currently amended) A computer implemented process of claim 3, classification process, wherein the steps are saved in the batch code by clicking a Save button, recalled by clicking a file button, and executed by clicking a batch command button in the Graphical User Interface of the software implementation. ~~A computer implemented process of claim 3 (classification), wherein the steps are saved in the batch code and executed by batch command. The batch code can be entered into the system in several ways, including:~~

- ~~a. Click a save button to save the current setting, including key, search directory, and parameters into a batch code.~~
- ~~b. Click a file button to recall one of many batch codes saved earlier.~~
- ~~c. Cut and paste or simply type in a batch code by keyboard.~~
- ~~d. Obtain the code from a file.~~

7 (Currently amended) A computer implemented process of claim 1 and 3 (~~search and classification~~), further comprising the step of retraining, which. ~~This allows the system to be trained by more than one image, or segment of an image, or a directory contains images.~~

8 (Withdraw) Claim 8 is deleted. ~~A computer implemented process of claim 1 and 3 (search and classification), further comprising the step of simply mapping a part of or all of the parameters to one or two integers represented by Scrollbar(s), thus allowing the simplification of setting parameters.~~

9 (Currently amended) A computer implemented process of claim 1, further comprising output results being listed in a result file, which has a list of names and weights:

- a. Wherein the weights of an image are related to the characteristics, which users are looking for.
- b. Click the name of each image and an image will be displayed on the screen.

~~A computer implemented process of claim 1 (search), further comprising output results being listed both in the system and in a new exiting process such as Microsoft Internet Explorer. The output web page has a list of names and weights:~~

- ~~e. The weight of an image is related to the characteristics users are looking for (the weight).~~
- d. ~~Click the name of each image and an image will pop up on the screen.~~

10 (Currently amended) A computer implemented process of claim 3, further comprising output results being listed in a result file, which has a list of names and weights:

- a. An image link for each image in the search directory;
- b. The classification weights of this image in each class; and
- c. The classification result of this image as a link.

~~A computer implemented process of claim 3(classification), further comprising output results being listed both in the system and in a new exiting process such as Microsoft Internet Explorer. The output web page has a list of names and weights:~~

- ~~a. An image link for each image in the search directory;~~
- ~~b. The classification weights of this image in each search; and~~
- ~~c. The classification of this image as a link.~~

11 (Currently amended) A computer implemented process for content-based images verification, identification, retrieval, and classification with software components, which use IVI-API as an application-programming interface. ~~A computer implemented process of claim 1 and 3 (search and classification), wherein the steps of setting parameters comprises the "Area of Interest", which specifies an image segment, which is specified by 4 numbers: the eoordinates of the upper left corner and the bottom right corner and obtained in two clicks.~~

12 (Currently amended) A computer implemented process of claim 1 and 3 (search and classification), wherein the steps of setting parameters comprises the Internal Representation ~~"internal representation"~~, which specifies the dimensions of a pixel array used for computation, which may or not be the actual image pixel array.

13 (Currently amended) A computer implemented process of claim 1 and 3, wherein the steps of setting parameters comprises the Symmetry, which represents similarity under certain types of changes, such as Intensity, Translation symmetry, Scaling, Rotation, combined Rotation and Scaling, or combination thereof and which is implemented by physically applying the

sample image to all possible positions and train the software with all of these transformed images or segments. ~~A computer implemented process of claim 1 and 3 (search and classification), wherein the steps of setting parameters comprises the “Symmetry”, which represents similarity under certain types of changes, such as intensity, translation symmetry, Scaling, Rotation, combined rotation and scaling, or combination thereof.~~

- 14 (Currently amended) A computer implemented process of claim 1 and 3, wherein the steps of setting parameters comprises the Sensitivity, or whatever the terminology used, which defines a distance between two neural ABM nets generated by two images in a connection space such that the distance can be used to eliminate unmatched images. ~~A computer implemented process of claim 1 and 3 (search and classification), wherein the steps of setting parameters comprises the “Sensitivity”, which deals with the sample segment size, high sensitivity is for small segment(s) and low sensitivity is for large segment(s).~~
- 15 (Currently amended) A computer implemented process of claim 1 and 3, wherein the steps of setting parameters comprises the Blurring, or whatever the terminology used, which measures the distortion due to data compression, Translation, Rotation, Scaling, Intensity change, and image format conversion and which is implemented by enlarging a single image to a set of images by using the Hausdorff distance, or L1 distance, or L2 distance, or multiple distances define the radius of the set. ~~A computer implemented process of claim 1 and 3 (search and classification), wherein the steps of setting parameters comprises the “Blurring”, which measure the distortion due to data compression, translation, rotation, scaling, intensity change, and image format conversion, or combination thereof.~~
- 16 (Currently amended) A computer implemented process of claim 1 and 3, wherein the steps of setting parameters comprises the Shape Cut, or whatever the terminology used, which defines a distance between two images in an image space such that the distance can be used to eliminate unmatched images. ~~A computer implemented process of claim 1 and 3 (search and classification), wherein the steps of setting parameters comprises the “Shape Cut”, which eliminates many images that have different shapes as the sample segment.~~
- 17 (Currently amended) A computer implemented process of claim 1 and 3 ~~(search and classification)~~, wherein the steps of setting parameters comprise the Image Type “image types”, which specifies ABM or APN algorithm.

- 18 (Currently amended) A computer implemented process of claim 1 and 3 (~~search and classification~~), wherein the parameter is provide in a file, which specify more complicated setting than the graphical user interface. ~~For example, just search through images listed in a file.~~
- 19 (Currently amended) The ABM learning algorithm and the methodology of this algorithm of using the connection space to generate connections rather than a process of repetitions of modifying weights directly and observing the performances; the APN learning algorithm and the methodology of this algorithm of converting a binary neural net to a multi-valued neural net by deploying a mapping for each connection; the ABM recognition algorithm and the methodology of this algorithm of classifying images via the stable distributions of the Markov chain; and the APN recognition algorithm and the methodology of this algorithm of extending binary neural net results to multi-valued neural net results by computing a distance between the two images. ~~A computer implemented process of claim 1 and 3 (search and classification), wherein the neural layer deploys the ABM or/and APN algorithm.~~
- 20 (Withdraw) Claim 20 is deleted. ~~The ABM algorithm, including ABM learning algorithm and ABM recognition algorithm.~~
- 21 (Withdraw) Claim 21 is deleted. ~~The APN algorithm, including APN learning algorithm and APN recognition algorithm.~~
- 22 (Withdraw) Claim 22 is deleted. ~~A component of the ABM or APN algorithm, Symmetry “Symmetry”, which is implemented by physically applying the sample image to all possible positions and train the software with all of these transformed images image(s) or segments segment(s).~~
- 23 (Withdraw) Claim 23 is deleted.
~~A component of the ABM or APN algorithm, “Sensitivity” or whatever the terminology used, which deals a particular way of limiting the relevant neural connections in a particular computation. When ABM net, x, is trained, there will be certain connections. All possible connections together form a connection space, the connection H. Deploying a distance in this connection space is an important step in the ABM or APN algorithm (See the description of Sensitivity). The present invention covers all method, combination of limiting a connection set in the connection space, especially with a distance as a parameter.~~

- 24 (Withdraw) Claim 24 is deleted. ~~A component of the ABM or APN algorithm, Blurring or whatever the terminology used, which measures the distortion due to data compression, translation, rotation, scaling, intensity change, and image format conversion such that the Blurring can be used to eliminate unmatched images. A component of the ABM or APN algorithm, “Blurring” or whatever the terminology used, which measures the distortion due to data compression, translation, rotation, scaling, intensity change, and image format conversion. All possible images together form a space, the image space. This method expands an image in the search directory from a single point to a set defined by a distance in the image space (See the description of Blurring). The present invention covers all method, combination of creating an image set in the image space, especially with a distance as a parameter, for the purpose of expanding the key(s).~~
- 25 (Withdraw) Claim 25 is deleted. ~~A component of the ABM or APN algorithm, the “Shape Cut” or whatever the terminology used, is to eliminate many images using the concept of image space (See the description of “Shape Cut”). The present invention covers all method, combination of creating an image set in the image space, especially with a distance as a parameter, for the purpose of limiting the number of images to pass through.~~
- 26 (Withdraw) Claim 26 is deleted. ~~A component of the ABM or APN learning algorithm, where the connection space is used to generate connection, rather than a process of repetitions of modifying weights directly and observing the performances. Deploying the connection space for establishing connection is a very important part of the present invention. The present invention covers all method of creating the synaptic connections directly in the connection space, especially with a distance as a parameter.~~
- 27 (Withdraw) Claim 27 is deleted. ~~A component of the APN learning algorithm, which converts binary neural net to multi-valued neural net by deploying a mapping for each connection, as shown in the APN algorithm. The present invention covers all type of mapping.~~
- 28 (Withdraw) Claim 28 is deleted. ~~A computer implemented process for content based images verification, identification, retrieval, and classification with software components, which use IVI API as an application programming interface.~~

Appendix A. Accompanying Application Document and CD

1. Two CD's Labeled "Document, Sample Implementation"

A. The disks contain only three **ASCII** files.

B. Each disk in the duplicate set is identical.

C. Contents of the CD:

| File Name | Type | Size | Date | Description |
|-----------|------|---------|----------|---|
| ABM4_9 | TXT | 156,256 | 05-16-02 | Detailed description of ImageFinder 4.9 |
| ABM5_0 | TXT | 96,515 | 05-16-02 | Detailed description of PolyApplet 5.0 |
| ABM5_1 | TXT | 43,019 | 05-16-02 | Detailed description of TransApplet 5.1 |

D. These documents are Copyrighted:

ImageFinder 4.9: TX 5-385-330

PolyApplet 5.0: Pending

TransApplet 5.1: Pending

E. Interpretation: These three files will give detailed descriptions of the three sample implementations:

Detailed description of ImageFinder 4.9

Detailed description of PolyApplet 5.0

Detailed description of TransApplet 5.1

2. Two copies of the coil bound manual labeled "User's Guide, Attrasoft ImageFinder 4.9".

These are two hard copies of the User's Guide for Attrasoft ImageFinder 4.9.

3. Two CD's Labeled "Attrasoft ImageFinder 4.9"

A. The disks contain only **non-ASCII** files. The CD contains two types of files:

(A1) Installation file, which will install the following executable files to a computer with Microsoft Windows as the operating system:

- Attrasoft ImageFinder 4.9 for Windows 95/98/ME, execution files;
- Attrasoft ImageFinder 4.9 for Windows 2000/XP, execution files;

- Data File for running the software;
- User's Guide in Microsoft Word, and
- User's Guide in html format.

(A2) A set of executable files running from the CD with Microsoft Windows as the operating system:

- Attrasoft ImageFinder 4.9 for Windows 95/98/ME, execution files;
- Attrasoft ImageFinder 4.9 for Windows 2000/XP, execution files;
- Data File for running the software;
- User's Guide in Microsoft Word, and
- User's Guide in html format.

B. The Operating System is Windows 95, 98, ME, 2000, and XP.

C. Each disk in the duplicate set is identical.

D. Contents of the CD:

Not all contents are listed, because there are too many files. The two data directories, for example, contain more than 80,000 files. The Date information is not accurate due to the date setting of the computer, which creates these files.

Root Directory Contents:

| File Name | Type | Size | Date | Description |
|-----------|------|------|----------------|-------------------|
| DISK1 | ID | 5 | 01-05-90 9:31p | Installation File |
| DISK10 | ID | 5 | 01-05-90 9:31p | Installation File |
| DISK11 | ID | 5 | 01-05-90 9:31p | Installation File |
| DISK12 | ID | 5 | 01-05-90 9:31p | Installation File |
| DISK13 | ID | 5 | 01-05-90 9:32p | Installation File |
| DISK14 | ID | 5 | 01-05-90 9:32p | Installation File |
| DISK2 | ID | 5 | 01-05-90 9:32p | Installation File |
| DISK3 | ID | 5 | 01-05-90 9:32p | Installation File |
| DISK4 | ID | 5 | 01-05-90 9:33p | Installation File |
| DISK5 | ID | 5 | 01-05-90 9:33p | Installation File |
| DISK6 | ID | 5 | 01-05-90 9:33p | Installation File |
| DISK7 | ID | 5 | 01-05-90 9:33p | Installation File |

| | | | | |
|----------|-------|-----------|----------------|-------------------|
| DISK8 | ID | 5 | 01-05-90 9:34p | Installation File |
| DISK9 | ID | 5 | 01-05-90 9:34p | Installation File |
| SETUP | EXE | 47,616 | 01-05-90 9:31p | Installation File |
| SETUP | INI | 32 | 01-05-90 9:31p | Installation File |
| SETUP | INS | 147,449 | 01-05-90 9:31p | Installation File |
| SETUP | ISS | 510 | 01-05-90 9:31p | Installation File |
| SETUP | PKG | 15,061 | 01-05-90 9:31p | Installation File |
| _INST32I | EX_ | 306,666 | 01-05-90 9:31p | Installation File |
| _ISDEL | EXE | 8,192 | 01-05-90 9:31p | Installation File |
| _SETUP | 1 | 721,623 | 01-05-90 9:31p | Installation File |
| _SETUP | 10 | 1,454,681 | 01-05-90 9:31p | Installation File |
| _SETUP | 11 | 1,455,574 | 01-05-90 9:31p | Installation File |
| _SETUP | 12 | 1,455,468 | 01-05-90 9:31p | Installation File |
| _SETUP | 13 | 1,454,113 | 01-05-90 9:32p | Installation File |
| _SETUP | 14 | 1,074,165 | 01-05-90 9:32p | Installation File |
| _SETUP | 2 | 1,454,796 | 01-05-90 9:32p | Installation File |
| _SETUP | 3 | 1,456,887 | 01-05-90 9:32p | Installation File |
| _SETUP | 4 | 1,455,245 | 01-05-90 9:33p | Installation File |
| _SETUP | 5 | 1,455,918 | 01-05-90 9:33p | Installation File |
| _SETUP | 6 | 1,455,206 | 01-05-90 9:33p | Installation File |
| _SETUP | 7 | 1,453,720 | 01-05-90 9:33p | Installation File |
| _SETUP | 8 | 1,455,603 | 01-05-90 9:34p | Installation File |
| _SETUP | 9 | 1,456,571 | 01-05-90 9:34p | Installation File |
| _SETUP | DLL | 10,752 | 01-05-90 9:31p | Installation File |
| _SETUP | LIB | 196,219 | 01-05-90 9:31p | Installation File |
| ABM49 | <DIR> | | 06-08-01 1:04p | Executable File |
| USPTO72 | <DIR> | | 02-28-01 7:15p | Data File |
| USPTO74 | <DIR> | | 05-21-01 4:33p | Data File |

E. Interpretation of the files

(E1) Files labeled “Installation File” are used to install the following executable files to a computer with Microsoft Windows as the operating system:

- Attrasoft ImageFinder 4.9 for Windows 95/98/ME, execution files;
- Attrasoft ImageFinder 4.9 for Windows 2000/XP, execution files;
- Data File for running the software;
- User's Guide in Microsoft Word, and
- User's Guide in html format.

To install the software to a Personal Computer using Windows, double click the setup.exe file.

(E2) The directories, labeled "Data", contain the data files to run the software. There are more than 80,000 files in the two directories, so they will not be listed.

(E3) The directories, labeled "Executable", contain the executable file to run from the CD.

Directory Contents:

| File Name | Type | Size | Date | Description |
|-----------|-------|-----------|-----------------|--------------------|
| 50X50 | <DIR> | | 06-08-01 1:04p | Data File |
| ABM49_2K | EXE | 385,536 | 06-08-01 11:54a | Executable |
| ABM_A1 | BMP | 25,182 | 08-31-99 11:02p | Executable |
| DEISL1 | ISU | 47,058 | 06-08-01 1:05p | Executable |
| IMAGEF~7 | <DIR> | | 06-08-01 1:04p | Data File |
| _ISREG32 | DLL | 24,576 | 02-07-96 8:07a | Executable |
| ABM48 | TXT | 79 | 06-08-01 12:26p | Executable |
| ABM48_1 | TXT | 6 | 03-23-01 9:20a | Executable |
| ABM48_2 | TXT | 6 | 03-23-01 9:21a | Executable |
| ABM48_3 | TXT | 6 | 03-23-01 9:21a | Executable |
| ABM48_4 | TXT | 6 | 03-13-01 2:28p | Executable |
| ABM48_5 | TXT | 6 | 03-13-01 2:28p | Executable |
| ABM48_6 | TXT | 6 | 03-13-01 2:28p | Executable |
| ABM48_7 | TXT | 6 | 03-13-01 2:28p | Executable |
| ABM48_8 | TXT | 6 | 03-13-01 2:29p | Executable |
| ABM48_9 | TXT | 6 | 03-13-01 2:29p | Executable |
| ABM49 | EXE | 386,048 | 06-08-01 10:53a | Executable |
| ABM4_9 | DOC | 3,598,336 | 06-07-01 10:52a | User's Guide, Word |
| FBI | <DIR> | | 06-08-01 1:04p | Data File |

| | | | | |
|----------|-------|-----|-----------------|--------------------|
| FINAL | <DIR> | | 06-08-01 1:04p | Data File |
| HELP | <DIR> | | 06-08-01 1:04p | User's Guide, html |
| LOCK_~15 | <DIR> | | 6-08-01 1:04p | Data File |
| LOCK_~17 | <DIR> | | 06-08-01 1:04p | Data File |
| NOTES | TXT | 140 | 03-23-01 10:33a | Executable |
| OBLIQUE | <DIR> | | 06-08-01 1:04p | Data File |
| STAMP | <DIR> | | 06-08-01 1:04p | Data File |
| USPTO | <DIR> | | 06-08-01 1:04p | Data File |

The interpretation of this subdirectory:

- The directories, labeled "Data", contain the data files to run the software.
- The directory, labeled "User's Guide, html", contains the user's guide files in html format.
- The file, labeled "User's Guide, Word", contains the user's guide files in html format.
- The files, labeled "Executable", contain the executable files for Windows 95/98/ME/2000/XP.

4. Two copies of the coil bound manual labeled "User's Guide, Attrasoft TransApplet 5.1"

These are two hard copies of the User's Guide for Attrasoft TransApplet 5.1.

5. Two CD's Labeled "Attrasoft TransApplet 5.1"

A. The disks contain only **non-ASCII** files. The CD contains the following files:

- Attrasoft TransApplet 5.1 software library for Windows 95/98/ME/2000/XP, COM/DLL file format;
- Sample Implementation Codes;
- User's Guide in Microsoft Word, and
- User's Guide in html format.

B. The Operating System is Windows 95, 98, ME, 2000, and XP.

C. Each disk in the duplicate set is identical.

D. Contents of the CD:

Root Directory Contents:

| File Name | Type | Size | Date | Description |
|-----------|-------|---------|-----------------|--------------------|
| ABM5_1 | DOC | 616,448 | 10-21-01 11:28a | User's Guide, Word |
| CHAP3 | <DIR> | | 10-19-01 4:31p | Examples |
| CHAP4 | <DIR> | | 10-19-01 4:31p | Examples |
| CHAP5 | <DIR> | | 10-19-01 4:31p | Examples |
| CHAP6 | <DIR> | | 10-19-01 4:31p | Examples |
| CHAP7 | <DIR> | | 10-19-01 4:32p | Examples |
| FBI | <DIR> | | 06-08-01 1:04p | Examples |
| HELP | <DIR> | | 10-19-01 4:40p | User's Guide, Word |
| OBLIQUE | <DIR> | | 06-08-01 1:04p | Examples |
| README | TXT | 567 | 10-20-01 10:51a | readme.txt |
| TRANS~26 | DLL | 282,112 | 0-21-01 11:00a | COM DLL |

E. Interpretation of the files

(E1) The file labeled "COM DLL" is the COM DLL software library file to be used by users.

(E2) The directories, labeled "Examples", contain the examples of how to use the COM DLL.

(E3) The files, labeled "User's Guide, Word" and the directory, "User's Guide, html", contain the User's Guide.

6. Inventor's Resume'.